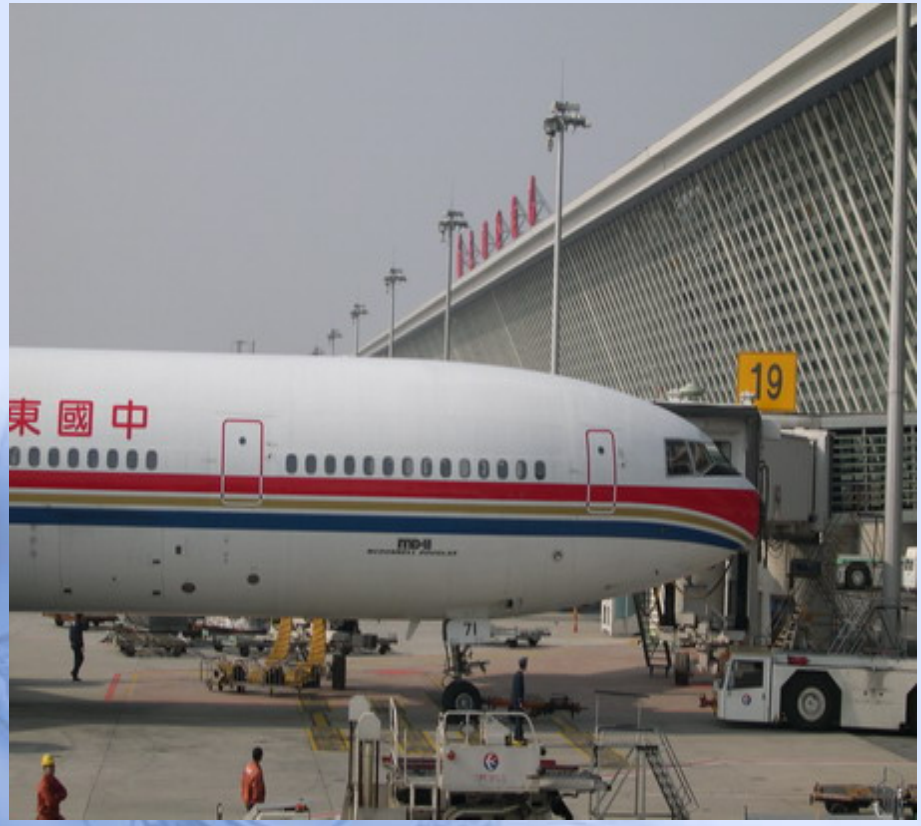
Increasing Needs for Modular Avionics in the CNS/ATM-Based Air Space

CARERI

May 2005

Highlights



- The progress in China air transportation
- The progress of China air space
- CARERI R&D in Modular Avionics for China market

Good Year is Coming

- China's air travel will continue to grow strongly to nearly five times its present level within 20 years
- Last year is a good one for the industry, with total profits of 8.69 billion yuan (US$ 1.04 billion), according to the General Administration of Civil Aviation of China (CAAC)
- These profits are equal to the sector's cumulative profits over the previous decade
- According to the CAAC statistics, passenger transport turnover is 120 million last year, a year-on-year increase of 38 per cent
- And the industry's cargo and mail transport volume totals 2.7 million tons, up 23.3 per cent year-on-year

Deregulation in China

- The official from General Administration of Civil Aviation of China (CAAC) said at 5th Air show China, 2004:
  - in the years ahead, administrative limits required for civil aviation projects will be reduced in order to allow enterprises to compete on a fair footing, while guaranteeing the interests of the State, enterprises and consumers

Examples

- Operation rights for domestic air routes will be subject to ever-relaxing procedures
- In addition to State-owned firms, foreign and private companies will be "guided and encouraged" to invest in air transportation, airports and other civil aviation projects
- "We'll actively adapt ourselves to the global air transport liberalization tendency by phasing in the opening of China's air transport market"--CAAC

Open Sky to More Users

- Relaxation of the policy started since last year
- The State Council and the Central Military Commission issued a new regulation on general aviation, lifting many of the complicated procedures and prohibitions which seriously restricted civil flights
- On December 22, when the National Working Conference on Civil Aviation is held in Beijing, CAAC's director declared that procedures of examination and approval of the establishment of general aviation companies would be simplified
  - Each aircraft is required to notify the air traffic administration authority every time it wants to fly. The authority must then obtain further authority from the air force authority, who has the final say
  - Few general aviation corporations in China are making profits

Further Steps

- The department of air traffic administration in charge of the middle and south regions is working to lower the limits on low altitude flights
  - Flights below 900 meters are considered low altitude
  - General aviation flights in public security, medical care, and some commercial purposes will be given more freedom
  - Flight amusement parks, semi-professional and professional training institutes, aircraft producers and research institutes and even insurance companies are making up a new group

Competition

- However, the development of China's civil air transport sector will also be challenged by the escalating fuel cost and competition from other transport means like trains, which accelerated speed for the fifth time in year 2004 and provided more comfort and convenience to passengers
- The nation's last railway speed increase was launched on April 18 last year with the speed of its major lines raised to 160 kilometers per hour
- The acceleration cut the travel time between Beijing and Shanghai, the two of the largest cities in China, from 14 hours to 12 hours

Railway, The Giant

- China will have more than 22,000 kilometers of railways with a speed above 120 kilometers per hour after it raises the speed for the sixth time
- Of the total, 5,300 kilometers will have a speed of 200 kilometers per hour, including the passenger lines such as Beijing to Shanghai, Beijing to Harbin and Lanzhou to Lianyungang
- China will launch 58 new projects and continue the 48 projects from 2004 within this year, involving the building of 714 kilometers of new lines, 523 kilometers of double track lines and 875 kilometers of electric rail routes
- The railway network will handle a total of 1.15 billion passengers, an increase of 31 million over last year, and 2.7 billion tons of cargo this year, a jump of 200 million tons

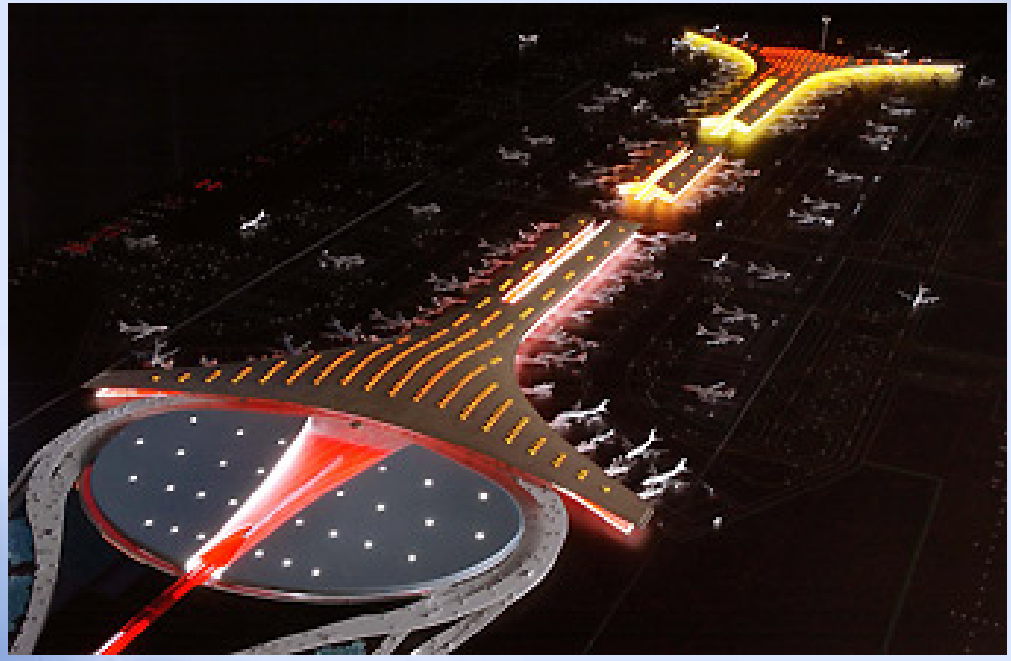
China's First High-speed Railway

- China's first high-speed railway line is to be kicked off and enter full construction
- Construction projects of this railway line, which runs through eastern, central and western China, have been gradually activated
- Upon completion in 2020, it will reduce the Chengdu-Shanghai traveling time to 10 hours

Trains on the Way

- Since highway and air transportation are inherently limited in capacity, and water transport on the Yangtze is withdrawing from the conventional passenger transportation market, high-speed railway has become the top choice for its being safe, fast, comfortable and all-weathered. The Shanghai-Wuhan-Chengdu high-speed railway will become a new line linking China's eastern costal regions, central and southwest areas

The Wing To Fly



Infrastructure To Expand

- In the wake of the official signing that will see the number of flights between China and the other countries multiply, officials are looking for ways to smooth the way for the industry's development
- Bigger airports and more landing strips are a big part of those efforts

Hubs? Plus Multi-Runways?

- The newly-built Guangzhou Baiyun International Airport in South China is put into operation on August 2004 to resolve the overcrowded situation
- The second runway in Shanghai Pudong International Airport is completed in this March and began two runway operation formally in April 14,2005 to help alleviate the pretty new airport's strained handling capacity


中华人民共和国地图
Beijing
北京
天津
上海 Shanghai
重庆
Guangzhou
and
Hongkong

Airports

- China has since 1978 spent a total of US$15 billion to build airport and air traffic control facilities, adding that China has built 48 new airports and renovated or expanded more than 80 others
- Currently, China ranks the fifth in total air traffic turnover just behind the United States, Germany, Britain and Japan

Private Airlines Ready To Take Off

- Okay Airways became the first private carrier
- The first passenger flight of Okay Airways takes off at 9:00am from Binhai International Airport in Tianjin March 11, 2005
- The Boeing 737-900, with 81 people aboard, flew from the airline's base in the northern city of Tianjin to Kunming, a popular tourist spot in the mountain southwest

Okay Airways

- Funded by three private companies and three people from Beijing and Shenzhen in South China's Guangdong Province, has registered capital of US$ 36.3 million
- Expected to engage in air cargo and express services, passenger charter services and ground distribution services
- Headquartered in Beijing, the airline's home base is installed in Binhai International Airport in neighboring Tianjin Municipality
- Three Boeing 737 aircraft and a 76-member staff

Others Follows…

- Besides Okay Airways, CAAC has given a nod to three other private operators to start airlines.
- They are Shanghai-based Spring International Airlines, Chengdu-based Eagle Airlines and Huaxia Airlines in Gansu Province.

RNP Demo in Tibet

- **April 21, 2005** -- The Civil Aviation Authority of China (CAAC), Air China, Boeing and Naverus have successfully demonstrated new navigation procedures at Lhasa, Tibet
- That will enable Air China to operate its Boeing 757 at Lhasa Airport with greatly enhanced operational efficiency and improved safety margins
- In two flight demonstration s on April 18 and 20 at Lhasa , Air China technical pilots conducted RNP approach and departures using the procedures developed by the Boeing and Naverus team
- The crew proved the effectiveness of the RNP procedure for Lhasa operations, and demonstrated the 757-200's capability to perform with the required accuracy and containment
- "The successful test flights of RNP procedures in Lhasa airport will speed up the adoption of this state-of-the-art technology in China," said CAAC Vice Minister Wang Changshun. "It has significant implications for constructing and developing airports in difficult terrains in western China and can help open up new flight routes for busy hubs in eastern China.“

AVIC I

- China Aviation Industry Corp I (AVIC I), China's major aircraft manufacturer, to become the leading supplier of regional airliners
- AVIC I launched the ARJ21, China's advanced regional jet program, in December, 2003 with 35 orders
- To offer regional jets of the best quality but at a price and operational cost up to 10 per cent lower than other counterparts
- To provide products that most suit Chinese market needs

MA-60

- A new Chinese Modern Ark is flying up into the sky
- MA-60, a regional aircraft, is newly developed and manufactured by China's Xi'an Aircraft Industry Company
- With 60 seats, the regional plane has been proved to be safe, economical and comfortable
- The two MA-60 airplanes are delivered to Zimbabwe in April 23, 2005
- AVIC-I aims to export 20 MA-60s within this year

Chinese Market Needs

- In the latest big deal, six Chinese airlines signed an agreement in January to buy 60 of Boeing's new 787 jetliners for a total of $7.2 billion
  - China Eastern has been on a buying spree recently, signing a deal with US aerospace giant Boeing for 15 of its new 787 jets in January
  - Last year, it spent US$2 billion on 20 Airbus A330s to replenish its fleet in response to robust air travel demand
  - China Eastern signed an agreement to purchase five Airbus A319 aircraft in a deal worth 1.9 billion yuan (US$230 million) in March

Size, Range and Mode

- Big one vs. Small one
  - Trunk vs. regional
- Medium range vs. long Haul
  - Narrow body vs. Wide body
- Hub-Spoke vs. Hub-Belt

Inter-city Rail System

- An inter-city rail line between Shanghai and Nanjing, Jiangsu Province, will be as fast and convenient as the subway in the near future, according to local railway authorities
- New express trains will be Bombardier high-speed trains, with an average running speed of 132.7 kilometers per hour, expected to cut down the travel time between the two cities by 25 minutes to only two hours and 17 minutes
- The line between Shanghai and Nanjing is 303 kilometers long. At present, 79 passenger trains and 53 cargo trains travel the route every day, making it one of the busiest rail lines on the planet
- The charge for a soft seat ticket will increase to 79 yuan (US$9.52), while a hard seat ticket will cost 52 yuan

2,200 Planes in Next 20 Years

- In the years leading up to 2023, the number of China's civil passenger planes is expected to more than triple in size, from the current 664, to reach 2,373
  - said vice-director of the Aviation Industry Development Research Center of China
- The center forecast that China could post an annual gross domestic product growth of 6.8 per cent between 2004 and 2023, when tourism will grow at an even faster pace

ARJ Aircraft Project

ARJ21 is a 70 ~ 90-seat turbofan regional aircraft for medium and short trip, made up of double circular section airframe with five seats per row, low-wing, high even tail, front three-point type retractable landing gear, powered by high bypass ratio turbofan engines

With two-crew cockpit, the avionics system adopts bussing technique which Rockwell Collins is the supplier

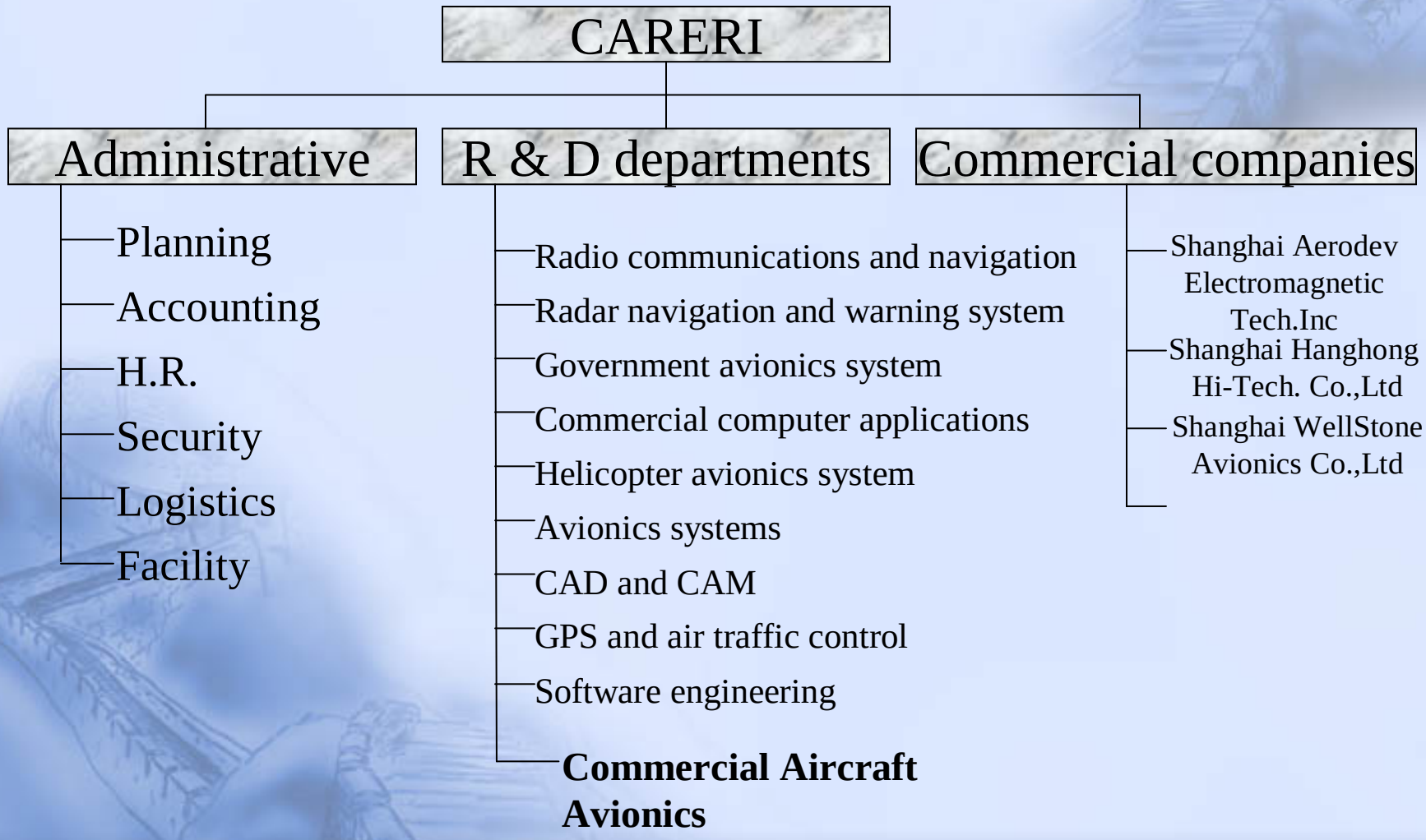
ARJ21 has supercritical wing with relatively big sweepback plus winglet, which helps enhance the cruising performance of aircraft within the designed cruising weight

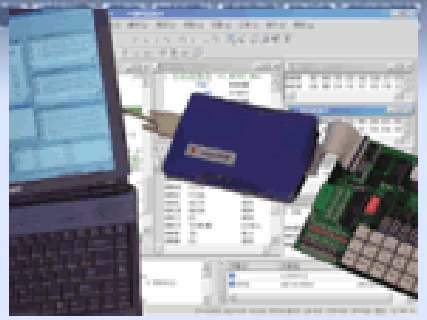
Chinese Aero Radio Electronics Research Institute

Chinese Aero Radio Electronics Research Institute

- CARERI, as the unique state owned Avionics Institute based on Shanghai, is engaging to R&D the whole solution of avionics, especially in Modular Avionics Concept, for meeting the increasing and various domestic aircraft market
- This slide document will highlight our understanding and consideration in R&D Modular Avionics Concept based on the CNS/ATM environment

Organizational Chart





CARERI's Products and Services

- A Specialized Research Institution for the airborne electronic equipment of Chinese aviation industry
  - 5 well equipped national and regional key labs and 8 specialized labs of itself
  - Core technologies in avionics integration system, communication & navigation and system integration
- Creation Innovation
  - Production and industrialization of high-tech achievements
  - Advanced- equipped SMT production line and precise process equipment for lot production

Solution of Avionics

- Based on Modular System
- R&D for Core platform
- Common Use is the Top One Issue
  - OEM part and board suppliers
  - CARERI will take the integration of software with hardware
  - CARERI focuses on the application development
  - CARERI will play the integrator for aircraft user

Goals

- Minimize the cost in R&D
- Minimize the cost during whole life-cycle
- Better and flexible timing to market
- Pretty capability with relative performances

Points In The Solution

- Software defined system
  - Version variation
  - Certification check and control
- Minimize the system cost
  - Configuration of functional channel
    - Multi-path for the same function
      - Minimize the needs for hardware and equipment
    - Refine the function with operational time
      - Not every function covers the whole flight phases

Function Channel

- Radio Com and Nav
- Flight Control and Display
- Flight Control
- Aircraft sensors

Better Performance

- Analysis the system resources
  - Category of input data
  - Data working flow and process
  - Data output and application
- Air – ground resources integration
- Improve the flight safety
- System redundancy
- Certification guide and principle

System Safety and Security

- System configuration and function plug inserting
- System transparency
  - Identifiable to every side
  - From development to application
- Better training
  - Flight and ground crew
  - ATC crew

Open to All Comers

- Validated platform for integration of standardized components, technologies and tool based on a modular system for aircraft avionics application in China

Thanks!

- Further contact

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